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Food for body and soul: tourism development opportunities in the Western Cape

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This article applies spatial multiple criteria evaluation (MCE) by weighted linear combination of factor layers in a computerised geographical information system (GIS) to aid development of spatial policy and planning of cultural and food and wine tourism in the Western Cape. It explains spatial tourism development policy, tourism marketing and expressed tourist preferences that translate into suitability indicators or attraction features for capture in a spatial resource database. Two sets of tourism attractions are conceptually defined, captured in spatial format as mapped variables and statistically weighted for MCE modelling. The fine-scale outcomes in map format allow comparisons to be made of the effects of variable MCE execution rules for the two products. The application can be replicated for entrepreneurial and regulatory planning.

Voedsel vir liggaam en gees: toerisme-ontwikkelingsgeleenthede in die Wes-Kaap

Die artikel pas ruimtelike multikriteria-evaluering (MKE) toe deur die lineêre kombinering van faktoroorlegte in 'n gerekenariseerde geografiese inligtingstelsel (GIS) vir die ontwikkeling van ruimtelike beleid en beplanning rakende kultuur- en voedsel- en wyntoerisme in die Wes-Kaap. Ruimtelike beleid vir toerisme-ontwikkeling en -bemarking en verklaarde toeristevoorkeure word benut om geskiktheidsaanwysers vir opname in 'n ruimtelike databasis van verskynsels te ondervang. Twee stelle toerisme-attraksies word konseptueel as veranderlikes gedefinieer, gekarteer en statisties geweeg vir MKE-modellering. Die produk is fynskaalkaarte vir die twee toerismeprodukte nadat MKE uitgevoer is volgens beredeneerde toepassingsreëls en laat vergelyking van die twee produkte toe. Die toepassing kan elders herhaal word vir ondernemer- en reguleringsbeplanning.

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As societies develop, economies mature and global affluence and spare time increase, tourism becomes increasingly important.[1] Planning for tourism opportunities requires policy formulation, activity promotion and resource development, in particular at strategic regional and local spatial resolutions. Spatial planning by authorities and entrepreneurs has consumer needs, demands and trends in tourism preferences as its drivers. Hence, Bell *et al* (2007) prioritise research needs in this field as monitoring and assessing resource demands (tourists' behaviour, activity preferences), resource impacts (climate change, natural and social vulnerability), site-specific resource pressures (resource characteristics, visitor numbers, carrying capacity, conflicting uses), and planning for new and alternative developments (sustainable usage, regional and community strategies, building efficient resource databases, new technologies to support decision-making).

As a major generator of revenue and employment, tourism receives prominent attention from government policy development and implementation as well as entrepreneurial investment. Tourism is an efficient means to extract economic value from localised tangible and intangible environmental resources of cultural and natural origin; hence, it demands proper planning at strategic spatial and localised entrepreneurial levels. This article focuses on two related segments of the tourism spectrum (cultural as well as food and wine products) in a regional setting in South Africa, namely the Western Cape. This province is a premier tourism destination with vast development potential linked to a rich natural and cultural resource base, well-developed tourism infrastructure and its big six attractions (Table Mountain, Cape Point, Kirstenbosch, Groot Constantia, Victoria and Alfred Waterfront, Robben Island). Yet, provincial space is unevenly endowed with natural and human resources, ranging from lush coastal plains and mountain valleys studded with large urban concentrations to sparsely populated, dry and desolate inland plains. The geographic complexity and diversity of situated resources as products of their

1 The author acknowledges Prof S L A Ferreira for her insights into the tourism model, Dr A van Niekerk for GIS execution, the tourism experts who participated in the tourism workshop, and Cape Town Routes Unlimited for permission to publish the research results. Helpful comments by anonymous referees are appreciated.

biophysical properties and the political, social and economic framework in which they are produced, provide the province with a rich resource base for the linked development of cultural as well as food and wine tourism (Olson 2010).

Ideally, successful tourism at any locality must satisfy visitor experiences, enhance the quality of life of local populations and protect the local natural, built and cultural resource base, by avoiding the risk of exceeding environmental and social carrying capacities of destination areas, necessitating reinvention or rejuvenation of 'products' according to the concept of a tourism area life cycle (TALC) model in national and regional development plans (Butler 1980). Food and wine are conceptualised as potentially authentic cultural products that symbolise the culture of a destination as a place (Brown & Raymond 2006, Sims 2009). Such an approach recognises the importance of a sound spatial framework for planning and developing a sustainable tourism industry in local and national space (Boers & Cottrell 2007, Kanga *et al* 2011), so that regions become destinations in their own right. Yet, real-world evidence shows a paucity of theoretical and practical concerns for the incorporation of spatial planning principles in the design of development policy and the direction of development funding that follows resource evaluation and targeted investment. This article addresses this dilemma through a practical application of spatial information technology.

1. Research design and data

The article aims to show how modern spatial computing technology can operationalise tourism development policy in the Western Cape. It provides an overview of provincial policy, the tourism marketing framework, the cultural as well as food and wine tourism resource base, and the methodological approach of spatial multiple criteria evaluation (MCE) in a geographical information system (GIS) for the province. This prototype application, it is argued, can be replicated for similar spatial units elsewhere in South Africa or indeed internationally. Figure 1 explains the spatial MCE approach followed in this instance in ten sequential research steps, namely interpreting spatial development policies and determining spatial attraction factors from various perspectives, spatial variable selection and mapping,

digital conversion, standardisation and factor weighting, followed by MCE application and interpretation of the spatial outcome.

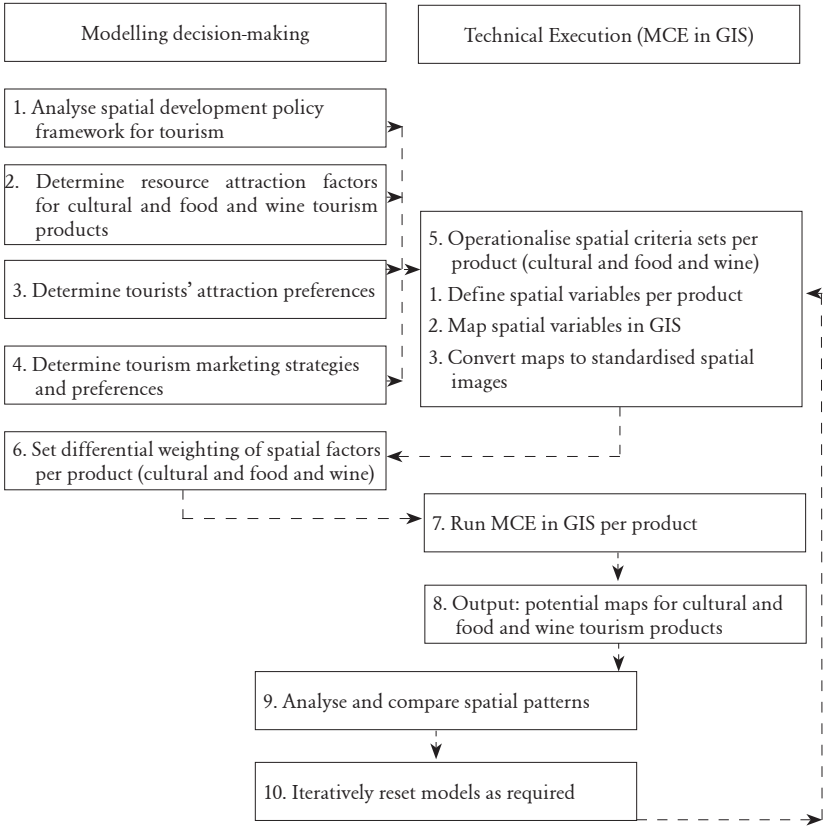

Figure 1: The research framework for MCE model-building

Iterative revision, if required, is possible, allowing experimental interaction between stakeholders and enhancing its application as a tool for forecasting and modelling a range of development preferences and scenarios. Relevant sections in the article elaborate on these steps. For each step, the application decisions and results regarding the

two tourism segments are compared to demonstrate the versatility and subtlety of MCE application and its potential role in planning decision-making.

The empirical content of the article is based on research conducted for Cape Town Routes Unlimited to identify spatial tourism gaps for development and market opportunities in the Western Cape (Van der Merwe *et al* 2008). Both cultural as well as food and wine tourism emerged as major development opportunities among nine identified tourism market segments. A panel of experts passed judgement on the indexing method for the measurement of the potential of cultural as well as food and wine tourism, market segmentation and tourists' product preferences. The destination definitions were translated to spatial operational format for cultural as well as food and wine tourism products, and a spatial database of phenomena and features indicating each product's potential (natural and human resources and human-made plant) was created. Relevant criteria for each product were selected from 80 available mapped variables as a spatial data inventory of determinants for cultural as well as food and wine opportunities and infrastructure in the Western Cape. These were used in an application of a spatial MCE model in GIS for generating high-resolution development potential maps for each product. The research concentrates on isolating variables that are spatially measurable and captures the main attraction factors of each tourism type to provide strategic guidance for locational decisions based on the cumulative strengths and advantages derived from these factors. By design, attention is concentrated on the provincial and regional levels and, to a large extent, withheld from the local level where products are refined and packaged for promotion to niche tourism markets – in other words, the entrepreneurial focus.

2. Multi-criteria evaluation in GIS

Sound comprehension of the modelling process and the spatial principles inherent in its performance is essential for evaluation of MCE efficacy in decision-making support in the geographical reality of tourism planning. The following sections serve to illuminate this.

2.1 The MCE process

Ideally, human decision-making should weigh multiple influencing factors to reach objective, balanced and logical conclusions. This principle in spatial decision-making is realised by overlaying spatial variables (mapped phenomena) and analysing their combined cumulative influence. The proven cumulative or clustering effect of the attraction value of proximate tourism resources is harnessed in this manner (Weidenfeld *et al* 2010). The realisation has only recently dawned that this represents the combination of the spatial manifestations of classical complex human and natural systems that collapse different landscapes into a categorisation scheme together with related resources (Proctor & Qureshi 2005, Olson 2010). In the geoinformatics age the method has been greatly refined and simplified in the form of MCE for application in GIS (Ascough *et al* 2002). This modelling methodology requires the application in a raster (maps converted to gridded images) modelling format (as opposed to the vector format of geographical feature data captured as points, lines or polygons in GIS). The method combines criterion values (in each individual raster image cell across all layers) mathematically in the GIS MCE module to form single potential images via the weighted linear combination formula:

$P = \sum W_i X_i$, (where W_i = weight of factor *i*, and X_i = criterion score/ cell value of factor *i*).

[Formula 1]

The application entailed the implementation of a stepped sequential process (Van der Merwe 1997) shown in Figure 1. In essence, it requires two parallel, cooperative processes to be performed, namely a decision-making process involving all relevant decision-making stakeholders (Steps 1-4, 6 in the diagram), and the technical gathering and manipulation of spatial data and the running of the software by a GIS specialist (Steps 5, 7, 8). In this application, workshop input mainly captured the former set, while the researcher performed data-gathering, generation of distance parameters, manipulation of each variable according to its significance in potential rating, the weighting of these variables (graded values assigned according to varying importance) for combination, and the eventual programmatic generation of cultural as well as food and wine tourism product

potential images (Step 8). Because differently calibrated programme runs generate different results, an iterative process allows revisiting the steps until results meet policy requirements (Heywood *et al* 1995, Boroushaki & Malczewski 2008). Whereas sensitivity analysis may be required to affirm particular model outputs, the argued scientific integrity of expert calibration is deemed sufficient to guarantee valid results.

2.2 The principle of the spatial propagation of feature influence in GIS

The criteria used in an MCE analysis are based on spatial relationships or situation characteristics. Situation factors measure the exposure that each raster cell has to resources or land uses that generate spatial externalities for the activity being sited (Cromley & Huffman 2006). During Step 2 (*cf* Figure 1), distance from target features to each cell in the factor image is calculated in a standard GIS procedure. This allows the logical object-based influence or potential-generating effect of features in the landscape to extend beyond their immediate physical presence or footprint in that landscape (Aplin & Smith 2011). In allowing individual layers of resource elements to propagate their relative influence over tourism potential space, both the numerical value of a feature type, denoting intensity of the phenomenon's occurrence there, and the nature of the location to which it refers must be factored in. This means that influence distance is made dependent on the relative intensity (size, quality and rating, for example) value of the target feature (Kanga *et al* 2011). When feature values denote mere presence or absence (Boolean values evaluate to the numbers 0 (false) or 1 (true)) the feature class exercises a linear distance effect radiating to a constantly diminishing degree from the feature. However, when features or various members thereof (point features such as towns, for instance) are rated along a value range (ordinal or scale variables, for example), the distance effect for higher valued features or parts thereof must extend farther according to the segment value - examples being roads of different classes, or facilities with different quality or size ratings. The rate of influence decay of a feature with distance from that feature does not need be constant (a linear function), but can be a logarithmic or similar function. However, this presupposes some empirical knowledge or measurement to calibrate the function. In this

application all distance-influence propagation was linearly calculated and classified into equal-interval, potential-generating class values.

MCE application in GIS for spatial decision support is described as "... perhaps the most fundamental of decision support operations in geographical information systems" (Jiang & Eastman 2000: 173). Geographers and scientists in related disciplines, various geographical regions and developmental realms of the world have initially concentrated their MCE applications on determining locational suitability of various phenomena based on multiple qualifying criteria, in particular regarding the natural environment (the literature is replete with examples not thematically relevant in this article). The most relevant and innovative applications for this study are found in the improvement of economic development conditions – expressed as activity preferences specifically in tourism applications. Examples include comparing areas' options for cultural as well as food and wine tourism activities,[2] or districts' tourism performance (Smith 1987, Kanga et al 2011), the latter now available in web-driven format (De Montis & Nijkamp 2006). These application examples are evidence that MCE application is growing in sophistication and its usefulness is being recognised universally. Yet, its application for determining the potential for cultural as well as food and wine tourism products in the same geographical area – as performed in this instance – is a fresh and innovative approach.

3. Allocating tourism development space in the Western Cape

Having established the principles of spatial modelling and its application, the drivers of tourism in the Western Cape that inform MCE modelling calibration are introduced next. They are encapsulated in spatial development policy and the tourist product preferences for the cultural as well as food and wine segments.

2 *Cf* Proctor & Drechsler 2003, Brown & Raymond 2006, Henderson 2009, Kumari *et al* 2010.

3.1 Tourism location policy

Designating potential centres for cultural as well as food and wine tourism in provincial space is determined by government policy and by an understanding of participant preferences. Initially, consultants developed an integrated tourism development framework (ITDF) according to a policy foundation provided by the provincial White Paper on tourism (DEAT 2001 & 2002). This framework reviewed tourism potential by assessing tourism product, plant and infrastructure, supply patterns, possible portfolios and theme routes, and matched it with the demand from primary and secondary international and domestic markets servicing the destination. This approach facilitated the identification of a formal, coarse-resolution hierarchy of spatial tourism development foci called gateways, distribution points, routes and destinations (DEAT 2002). The plan identified eleven nodes and corridors (tourism development areas (TDAs)) worthy of further development and offers a basis for comparison with the results of this research.

The scope of cultural as well as food and wine tourism as drivers for local and regional economic development across South Africa is maximised through appropriate policy interventions designed to support the competitive niches in local tourism economies (Bruwer 2003). Consequently, the Western Cape is informed by the wider international experience in planning the development of territorially based cultural as well as food and wine tourism.[3] The Western Cape is endeavouring to grow its tourism-product portfolio farther afield from the Cape Town metropolitan area and the highly developed southern coastal region. This raises the pivotal questions: Where to should government and industry direct tourism development in the Western Cape? Spatially and product-wise, where can and should cultural as well as food and wine tourism help to sustainably diversify the total product development load? Understanding the tourism landscape means knowing where strength of product is located and what the existing and future market requirements are, based on tourists' preferences.

3 *Cf* Baum 1998, Butler & Waldbrook 2003, Rogerson 2004 & 2007, Brown & Raymond 2006.

3.2 Defining tourism type and product preferences

The spatial resource base for cultural as well as food and wine tourism is multifaceted as it comprises a variety of participant, educational and spectator experiences and attractions (Tangeland 2011). Cultural tourism is a broad term encompassing a host of narrower niche tourism products and definitions. It includes food and wine tourism, although the latter is often treated as an independent product (Shor & Mansfeld 2009), but they are combined in this instance because of their close and symbiotic associations. Carter & Bramley (2002) divide heritage resources into geophysical, biological, cultural, historic, aesthetic and recreational categories, but with cultural significance derived from some specified values having economic, sociocultural, scientific and political significance (relating to history, rarity, research potential, classes of places, aesthetics, and creative, social or cultural association with a significant person or event). Even natural areas possessing some level of protection which suggests significance, sensitivity, rarity or resilience, as well as landscapes, are added in a place-based approach (Gnoth *et al* 2009, Halseth & Meiklejohn 2009). In a tourism product, heritage resources generally take the form of cultural goods and ethno-social, artistic and ambient resources (Knezevic 2008). In this instance, UNESCO's conditions for listing as World Cultural Heritage and defined by prescribed qualities such as authenticity, cultural meaning and value are appropriate. UNESCO distinguishes the immovable (monuments, archaeological sites, buildings, and gardens) and the movable (the content such as furniture, clothing, and weapons displayed in buildings) from the intangible (spiritual creations such as lifestyles, values, beliefs, language, folklore, rituals, customs, skills, crafts, performances, and demonstrations). Immovable artefacts represent classical structural heritage in architecture (Apostolakis & Jaffry 2005), industrial heritage (historical and contemporary) (Alonso *et al* 2010), and cultural heritage (Brown & Raymond 2006), but they are invariably human-made (Gnoth *et al* 2009, Kutzner *et al* 2009) and attract tourists. Included are anthropogenic phenomena such as architecture, cuisine, historical artefacts and art, especially rock art in South Africa (Halseth & Meiklejohn 2009). In this article cultural tourism attractions are broadly defined according to these approaches, and the tourism resources and support services were spatially captured for the Western Cape by Van der Merwe *et al* (2007).

Market intelligence regarding tourists' attraction preferences was gained by means of empirical surveys of tourist preferences in the Western Cape (Linde 2001, Donaldson 2007), as well as from standard statistical sources.[4] These sources confirmed the prominent position of the Western Cape in the international tourism market and identified the province's competitor destinations regarding natural beauty, wildlife and culture (DEAT 2002 & 2007). The Tourism Growth Strategy (SAT 2007a) identified these segments of varying strategic significance, namely established, emerging and untapped markets. Opportunities for growing several of these segments in cultural as well as food and wine tourism exist and these have been identified for the Western Cape. Consumer preferences or linking-product-to-market analyses show that most product development takes place around the natural resource base, the cultural product, the family product and affordable attractions. Yet, in the mind of consumers globally, South Africa's destination profile remains a rather monotypic adventure and wildlife destination with striking natural beauty and limited cultural attractions (SAT 2007a).

A workshop attended by a select group of tourism experts (Van der Merwe *et al* 2008) reached consensus on product guidance. The workshop confirmed, *inter alia*, that innovative tourism experiences need to replace stale products; resources are spread unevenly across provincial space; sustainable business ventures should ensure better visitor experiences and overall competitive edge of destinations; sustainability and ecological stability should be enhanced; local opportunities outside traditional tourist centres must help to reduce tourism's ecological footprint; spatial databases must be as exhaustive as possible, and tourism resource potential is measurable with spatial map overlays. The workshop reached consensus that rural, cultural as well as food and wine tourism are priority products among those identified for the Western Cape. It concurred with SAT (2007a) that new foci for tourism in areas beyond the traditional tourism routes and nodes must be developed if cultural as well as food and wine tourism are to make significant impacts on poverty and unemployment.

4 *Cf* DEAT, DTI, SAT 2005, 2007a & 2007b, SATSRU 2007, WTTC & Accenture 2007.

4. Calculation of regional product potential

Product-market match aims to balance the supply of tourism products, particularly attractions and services, with quality tourism destination plans in regional context (Puustinen *et al* 2009) in order to encourage visitation. Statistically relevant tourist segments usually have defined origins, exhibit particular age, gender, education and income profiles, and have specific preferences for what they do, see and eat (Kelly 1998). The MCE method calls for the selection of spatial variables (factors or criteria) as locational attributes in provincial space to determine potential attractions for these profiled visitors. This section introduces the principles according to which such variables were selected and concludes with the listing, discussion and comparison of the variables used for the two product segments targeted by the research.

4.1 Principles for the selection of spatial variables

The selection of variables is based on the realistic assumption that the tourism potential of a spatial unit (place, location, or area) is determined by three generic factors, namely the activities, facilities or resources available at the site and in its vicinity, the site's accessibility, and the presence of support services. These manifest as resource factors that collate the effects of the individual variables (Brown & Raymond 2006). Resources in tourism are defined as all the means and features used beneficially for tourism in a given area (Knezevic 2008). Spatial factors are invariably considered to possess and express, in tourism space, a specific sphere of influence (Clawson *et al* 1960, Cromley & Huffman 2006) as encapsulated by the measurement of the following questions:

- From how far will prospective tourists be attracted to this destination?
- How far does the local attraction influence extend to enhance other local resources or products, thus implying a cumulative attraction effect?

The accessibility factor is expressed or interpreted as proximity to the potential incoming tourist, hence accounting for opportunity demand as a function of travel cost (Carpio *et al* 2008). Each factor

also needs to be expressed as an attraction factor value regarding its quality (a closer resource of higher quality attracts the tourist more strongly). In GIS, proximity is measured by calculating the distance from all locations in experimental space to some target feature (for example, the Euclidian distance from each image grid cell to a road of a given class). The locational value of any potential tourism attraction is also determined by the potential product demand for that location according to the concentrations of population of a given economic class in particular areas of provincial and national space whence demand is generated. These niche culture-based products for the province are uniquely focused on natural, human, cultural and infrastructural features.

4.2 Variable selection in practice

The two tourism products are first considered separately, and their variable selections are then contrasted and compared to demonstrate the rationales of the selection arguments.

4.2.1 Variables selected for cultural tourism

The original research (Van der Merwe *et al* 2008) combined two individually identified niche sets of cultural resource features: contemporary (lifestyle, societies, and industries) and historical (monuments, architecture, and folklore) for which 455 locations were recorded in the Western Cape outside the Cape Town metropolitan area (Van der Merwe *et al* 2007). The 31 individual variable factors selected as criteria to measure potential for this product are listed in Table 1 and are arranged under the five rubrics of environmental aesthetics, cultural attraction diversity, population development levels, transportation connectivity, and endowment of tourism support services (in particular, travel comfort and security). The variables cover a range of features with intrinsic (objectively measurable) and extrinsic (mainly subjectively measurable) qualities or attributes (Priskin 2001, Carter & Bramley 2002). Six compound, indexed factors reduce the number of operational variables to the fourteen numbered ones in the table. In this way some redundancy is removed while the influence of the individual variables remains prevalent in the final analysis (albeit less influential) and the MCE procedure is made less cumbersome (Kumari *et al* 2010). Thematic consistency is maintained where the

more numerous low-ranked variables are combined (six in the case of Factor 14). The five main resource dimensions capture variations in the natural and cultural landscape, settlement structure, spatial accessibility and service provision in provincial space effectively when compared with similar research in South Africa (Halseth & Meiklejohn 2009, Lourens 2007), New Zealand (Gnoth *et al* 2009), Canada (Kutzner *et al* 2009), and Europe (Arabatzis & Grigoroudis 2010, Hall 2011). The variables reflect indirect-use values (ecological or future values) predictive of place identity, as opposed to direct-use values (recreation and economic values) more predictive of place dependence (Halseth & Meiklejohn 2009, Brown & Raymond 2006).

Table 1: Spatial factors selected for determining the potential of the cultural tourism product

Resource availability (quality) and measurement	Data*	Attraction or opportunity relevance	Raw weight*
Natural environmental assets			
1. Listed scenic drive distance (km)	S	Driving enjoyment, aesthetics	6
2. SATerrain Index (attractiveness)	O	Scenic enjoyment potential, aesthetics	3
3. Index for regional climatic character based on:			1
• Mean annual temperature (°C)	S	General outdoor comfort	
• Mean annual rainfall (mm, positive 1-5)	S	Outdoor activity opportunity	
Cultural heritage resources			
4. Declared natural and cultural attractions (density)	S	Attraction clustering, opportunity spectrum	9
5. Town's tourism sense of place rating	O	Cultural richness, aesthetics	8
6. Index for regional attraction endowment:			4
• Mountain passes and trails: presence	B	Hiking activity, cultural interest, aesthetics	
• Nature conservation areas: presence	B	Ecological activity and interest	
• Land cover (type)	N	Activity opportunity, diversity, interest	

Resource availability (quality) and measurement	Data*	Attraction or opportunity relevance	Raw weight*
Settlement and population structure			
7. Index of population development status:			4
• Education attainment index	S	Quality of human support, innovation	
• Economic welfare index	S	Quality of human well-being, innovation	
• Human needs: composite index (positive 1-5)	O	Required development needs	
8. Settlement development index:			2
• Town size: population number	S	Quality of institutional support, innovation	
• Population density per km^2	S	Quality of institutional support, innovation	
• District municipality IQ rating	O	Quality of institutional services, innovation	
Transportation accessibility			
9. Index of road and rail travel distances:			3
• Road network: distance from national road (km)	S	Ease of national access: activity opportunity	
• Road network: distance from main road (km)	S	Ease of local access: activity opportunity	
• Rail network: distance from stations by line type (km)	S	Ease of access: activity opportunity	
10. Index of air and hub travel distances:			3
• Distance from nearest airport (km)	S	Ease of international access: activity opportunity	
• Distance from nearest airfield (km)	S	Ease of national and local access	
• Weighted distance from metropoles	S	National market demand and access	
Support services and plant			
11. Cellphone coverage by service provider	O	Communications connectivity	6

Resource availability (quality) and measurement	Data*	Attraction or opportunity relevance	Raw weight*
12. Index of tourism-plant provision:			5
• Distance to nearest restaurant (km)	S	Travel and comfort support	
• Distance to accommodation facilities (density index)	S	Travel and comfort support	
13. Distance from Blue Flag beaches (km)	S	Quality activity opportunity	5
14. Index of travel and security support service provision:			2
• Distance to nearest petrol service station (km)	S	Travel support	
• Access to medical service: pharmacy (density index)	S	Emergency or well-being support	
• Access to dentist and doctor (density index)	S	Emergency or well-being support	
• Distance to nearest police station (km)	S	Emergency safety and security support	
• Distance to financial services (banks, density index)	S	Travel support	
• Distance to nearest post office (km)	S	Travel support	

* Notes to Tables 1 and 2:

Data type: N = Nominal; O = Ordinal; B = Boolean (0 or 1); S = Scale. Data sources: Van der Merwe *et al* (2007); Western Cape Towns Research project; Chief Directorate Surveys and Mapping: 1:50 000 digital layers; ENPAT; Cape Nature; Centre for Geographical Analysis spatial database; South African Weather Bureau; Council for Scientific and Industrial Research; Multiple and compound indices; GIS-derived computations.

Raw weights: The relative importance attributed to variables on a scale of 1 to 9 as used in Section 4.4.

4.2.2 Variables selected for food and wine tourism

This product attracts a rather exceptional niche market catering to both domestic and foreign tourists. The wine tourist and, by implication, the food tourist typically has a high socio-economic status (Shor & Mansfeld 2009). The group's preferences determined the variable factors selected for measuring its product opportunity listed in Table 2. Food tourism should be highly focused on attractions

such as unique local cuisine coupled with cultural activity, because food in some ways projects the identity and culture of a destination (De Almeida 2010, Karim & Chi 2010). Wine has a strong regional focus, because grape cultivation transforms landscapes aesthetically and in a signature fashion, and wine consumption is centred on well-defined and marketed production centres (Bruwer 2003). Food, wine and tourism (culinary or gastronomy tourism) have very close relationships and the former two can be major drawcards and primary motivators to travel as they satisfy a multiplicity of physiological and other needs and contribute to the perceptions of and satisfaction with the overall authentic travel experience (Henderson 2009, Sims 2009, Karim & Chi 2010). The wine product incorporates an appreciation of beverages, both alcoholic and non-alcoholic, although wine tourism is studied and marketed independently (Bruwer 2003). Food and wine as the core products are essential destination characteristics and offer a cultural experience for which the selection of variables is determined by tourist preferences (Shor & Mansfeld 2009). The food and wine tourism database records 312 locations in the Western Cape outside the Cape Town metropolitan area (Van der Merwe *et al* 2007). The literature-supported technical arguments and rationalisations for operationalising these variables are identical to those offered in the previous section. A total of 23 individual factors were selected as criteria to measure the potential for this product, all captured under the same dimensions as the previous product but with different segment emphases. Three compound, indexed factors reduce the total of operational variables to the thirteen numbered in Table 2. Again, thematic consistency is maintained where the more numerous low-ranked variables are combined (five in the case of Factor 5).

Table 2: Spatial factors selected for determining the potential of the food and wine tourism product

Resource availability (quality) and measurement	Data*	Attraction or opportunity relevance	Raw weight*
Natural environmental assets			
1. Listed scenic drive distance (km)	S	Driving enjoyment, aesthetics	7
2. Index for environmental attractiveness:			4
• SATerrain Index (attractiveness)	O	Scenic enjoyment potential, aesthetics	
• Permanent water presence: distance from line-channels (m)	S	Running water, aesthetics, tranquillity	
• Permanent water: distance from surface areas (m)	S	Dams, lakes, rivers, aesthetics, tranquillity	
• Land cover (type)	N	Landscape diversity, interest, aesthetics	
Cultural heritage resources			
3. Declared natural and cultural attractions (density)	S	Attraction clustering, interest, aesthetics	7
4. Town's tourism sense of place rating	O	Cultural richness, interest, aesthetics	8
Settlement and population structure			
5. Index of population development status:			2
• Education attainment index	S	Quality of human support, innovation	
• Economic welfare index	S	Quality of human well-being, innovation	
• Human needs: composite index (positive 1-5)	O	Required development needs	
• Town size: population number	S	Quality of institutional support, innovation	
• Population density per km^2	S	Quality of institutional support, innovation	

Resource availability (quality) and measurement	Data*	Attraction or opportunity relevance	Raw weight*
6. District municipality IQ rating	O	Quality of institutional services, innovation	5
Transportation accessibility			
7. Road network: distance from national road (km)	S	Ease of national access	4
8. Road network: distance from tarred roads (km)	S	Ease of local access	7
Support services and plant			
9. Distance to nearest listed restaurant (km)	S	Food catering	9
10. Cellphone coverage by service provider	O	Communications connectivity	6
11. Distance to nearest petrol service station (km)	S	Travel support	6
12. Distance to accommodation facilities (density index)	S	Travel and comfort support	4
13. Index of travel and security support service provision:			2
• Access to medical service: pharmacy (density index)	S	Emergency or well-being support	
• Access to dentist and doctor (density index)	S	Emergency or well-being support	
• Distance to nearest police station (km)	S	Emergency safety and security support	
• Distance to financial services (banks, density index)	S	Travel support	

*Notes listed below Table 1.

Similary, the five main resource dimensions capture variations in the natural and cultural landscape, settlement structure, spatial accessibility and service provision in provincial space effectively, as attested by complementary research done in South Africa (Lourens 2007, Halseth & Meiklejohn 2009), Australia (Ecker *et al* 2010), New Zealand (Hall 2011), Canada (Kutzner *et al* 2009), Israel (Shor & Mansfeld 2009), Britain (Sims 2009), France, Italy, and Thailand

(Karim & Chi 2010), and Greece (Arabatzis & Grigoroudis 2010). Note that the locations of wine estates are included with variable 9 in this database.

4.2.3 Comparison of the variables selected for cultural as well as food and wine tourism products

The application of MCE presupposes that modelling input (hence, the spatial outcome) per tourism product can vary according to three procedures evident in Figure 1, namely the selection of attraction feature preferences per product (Steps 2-4), the measurement standardisation of these feature images per product (Step 5.3), and the differential weighting of factor layers per product (Step 6). The presence of the same five dimensions in the two product models is not problematic because the number and types of variables in each dimension are not identical, and the indexed variables represent different component variable weights. Individual variables are often retained for one product while being incorporated in an indexed variable in the other product. This allows for subtly stronger emphasis to be given to specific variables in the model. These differences ensure different spatial opportunity outcome images, because the occurrence of represented features and factors varies over provincial space. These features are complemented by modelling refinements produced by variable feature-specific measurement standardisation and factor weighting.

4.2.4 Standardisation of potential measurements

Step 5 of the MCE process is necessary, because most spatial data sources were accessed in the original analogue (data lists) and vector (maps) formats and had to be converted to rasterised digital images. This step required the crucial decision to be made about the resolution (cell size) of the raster images because it implies a generalisation of data from the exact vector locational description to a grid-cell sequence switch that automatically causes data generalisation. A fine-scale raster (<50 m) implies cumbersome and computationally intensive image sizes and an implied unrealistic level of data accuracy. A coarse-scale raster (>5 km) overgeneralises the data, causes data loss and generates output that has little functionality for decision support. Consequently, all raster images were standardised to a cell size of 1 km by 1 km. This means that all data are approximated to

the nearest one kilometre and that all results demarcate spatial units of one square kilometre. The generated image convincingly shows that this operational decision was appropriate and practical.

The variables listed in Tables 1 and 2 were measured in the indicated variable units and data types. Since a range of different measurement units is mapped initially (for instance, slope in degrees, height in metres, distance in kilometres), it is imperative that these raw values per input image be standardised, because MCE application in GIS requires that all image overlays be combined virtually and expressed in the same measurement unit (Onosemuode & Dare 2010). Many of the factor image variables indicate the graduated presence or absence of a feature, but in most instances the principles of distance (influence buffers measured in kilometres) or interpolated density of occurrence have been employed. Each variable in the list demonstrates usefulness for measuring some form of tourism potential. A standard potential-rating scale for the original value range in the image cells was devised, such that they correlate positively with the potential they reflect (higher values indicate greater potential for the product), and these can differ according to product (the same feature can be differently scaled for the different products it influences). Although rating scales can be applied in a number of ways, this research applied the rating scale normally recommended in the literature to range from 1 (lowest potential) to 5 (highest potential). This range accords with the human ability to comprehensibly and consistently judge differences between sequential values. Each factor image had its original (raw) cell values reclassified according to the potential scale of 1 (low), 2 (medium-low), 3 (medium), 4 (medium-high) and 5 (high). In many instances, the researchers, as scientists, performed an expert-based evaluation to assign scale values to the raw image values. The values of most derived distance images were calculated statistically according to quantiles (mostly quintiles, for instance five equal-interval classes) or the Jenks (1967) natural-breaks functions in ArcMap software.

4.3 Factor weighting

The MCE procedure allows the manipulation of input to resemble reality as closely as possible in an otherwise automatically computed (*cf* Formula 1) execution in the GIS software. The method is justified

and explained next before the applied weightings are introduced and compared.

4.3.1 The principle and method of factor weighting

Combining potential-coded georeferenced overlay themes in GIS requires standard combination procedures through overlaying and the use of standard mathematical operators like addition or multiplication. By implication, all variable images entered into the equation carry exactly the same weight and contribute equally to the result. Clearly, such an approach contradicts the reality of normal decision making where influencing factors contribute with various intensities to sway decisions (Priskin 2001). So, Step 6 of the MCE process (Figure 1) requires that the variables selected be differentially rated and weighted, with the weights assigned to participating factors being proportions summing to 1.0 (or as percentages summing to 100). The subsequent MCE process allowed factors to have differential effects while potential cell values in the potential image still ranged between 1 and 5.

The weights are calculated according to the Saaty (1977) methodology that operates on the basis of a reciprocal matrix in which each variable is compared and scaled for importance to all other variables in the equation on a scale of 1 to 9 (positive and negative). A detailed description of the procedure is provided in Van der Merwe (1997) on how it calculates the weights automatically from the entered weight values and it also performs a consistency check. The consistency value must be below 0.1. The weights calculation was performed by the Canadian Conservation Institute online facility that allows the entering of values in a matrix or line-by-line mode.

4.3.2 Factor weighting for the cultural tourism product

The weights derived from the calculation method generated the weight rankings of the fourteen selected factors as shown in Table 3.

Table 3: Weights applied to factors for the cultural tourism product

Factor	Weight (%)	Factor	Weight (%)
9. Natural and cultural attractions	25.2	7. Population development status	4.7
5. Town's tourism sense of place	15.5	2. SATerrain Index	3.0
1. Listed scenic drive	10.6	9. Index of road and rail travel	3.0
11. Cellphone coverage	10.6	10. Index of air and hub travel	3.0
12. Tourism plant provision	7.1	8. Settlement development index	2.0
13. Blue Flag beach presence	7.1	14. Travel and security support service	2.0
6. Regional attraction endowment	4.7	3. Index for regional climatic character	1.5
[Consistency ratio: 0.021]		Total	100.0

A high consistency was obtained in the allocation process and no factor dominates disproportionately. The presence of cultural tourism assets (designated and captured accurately by Van der Merwe *et al* 2007) are emphasised as they are the main drawcards for the cultural tourist. The cultural setting, as represented by towns' sense of place, encapsulates place identity, place dependence and place-specific landscape values (Brown & Raymond 2006), and accommodates the place-based approach advocated by Halseth & Meiklejohn (2009). This factor occupies the second position and is followed by a range of factors which gauge the potential for an enriching and comfortable stay at the location.

4.3.3 Factor weighting for the food and wine tourism product

The weights derived from the calculation method generated the weight rankings of the thirteen selected factors shown in Table 4.

Table 4: Weights applied to factors for the food and wine tourism product

Factor	Weight (%)	Factor	Weight (%)
9. Distance to nearest listed restaurant	22.3	6. District municipal IQ rating	4.6
8. Tourism sense of place rating	15.8	2. Index for environmental attractiveness	3.0
1. Listed scenic drive	10.5	7. Distance from national road	3.0
3. Natural and cultural attractions	10.5	12. Distance to accommodation facilities	3.0
8. Distance from tarred roads	10.5	5. Index of population development	1.5
10. Cellphone coverage	6.9	13. Travel and security support service	1.5
11. Distance from petrol stations	6.9	[Consistency ratio: 0.022]	(100.0)

Again, high consistency was obtained in the allocation process and no factor dominates disproportionately. The primary provision presence of restaurants (captured accurately by Van der Merwe *et al* 2007) for the food and wine product is not surprising as restaurants and wine estates are the main drawcards for this type of cultural tourist (Karim & Chi 2010). The cultural setting, as represented by towns' sense of place, is again rated highly, but the range of factors gauging an enriching and comfortable stay in the location is scaled differently. Ease of travel as represented by access to local tarred roads and petrol stations accounts for this argument.

4.3.4 Comparison of factor weightings for the cultural as well as food and wine tourism products

The weighting exercises for these factor sets were completed separately and independently. The relative importance of each factor was rationally argued to fit the preferences expressed by the relevant tourist sector. Consequently, it is not surprising that variables directly relevant to the particular sector are ranked at the top, with related factors (both products are culture-related and attraction-driven) appearing in switched, but strongly supporting, roles. Factors measuring ease

of travel and a pleasant and well-serviced travel itinerary are rated (although differently ordered) lower down on both scales, but retain a felt presence. It is noted that, when single variables were retained for one product while being incorporated in an indexed variable in the other product, pertinently stronger influence could be allocated to such factors (for example, distance from tarred roads in Table 4 versus index of road and rail travel in Table 3).

5. Results: spatial outcome of MCE application in GIS

The results of the MCE operation in GIS to generate potential-rating images for the two tourism products are shown in Figures 2 and 3, respectively. Both maps show the highly nuanced and detailed (1 km^2 resolution) spatial patterns of potential allocation as determined by the selection and weighting of the different factors in combination. Each pattern is considered separately before drawing comparisons between them.

5.1 Spatial demarcation of the potential cultural tourism product

The product potentials portrayed spatially by Figure 3 have a clear metropolitan and urban bias in their territorial manifestations. This is not surprising since most cultural attractions are located in these settings and the database had been collated at urban locations. The prominence of the Cape Town-Winelands (including Paarl, Stellenbosch and Franschhoek) cluster is eminent and aligned along linked corridors. A second cluster is evident along the Garden Route coastal belt from Mossel Bay to Plettenberg Bay. Prominent cores manifest at platteland towns well known for cultural tourism such as Oudtshoorn, De Rust, in the Breede Valley including a Robertson-Montagu-Swellendam-Barrydale cluster and at satellite attractors such as the Hex River valley, Ceres and Tulbagh. Other satellite attractors are Clanwilliam and the coastal belt from Kleinmond to Hermanus and Stanford. Many clustered and corridor-linked concentrations at the significant medium-high and even the medium attraction levels are evident, emphasising the excellent potential for this product throughout the province. The West Coast and islands of

potential attractions such as Beaufort West and Bredasdorp-Napier earn notable attention. Overall, it is noteworthy that the procedure results in significant potential allocations to less-developed rural platteland towns. The regionally informed interpreter can glean valuable locational insights from these detailed map patterns. Significant smaller peaks of opportunity are evident at local towns that could attract focused attention. It should be emphasised that the demarcation of potential hot spots for this product was successful and offers a spatial indication for fruitfully selecting local areas where specific initiatives can be launched or institutionally sponsored.

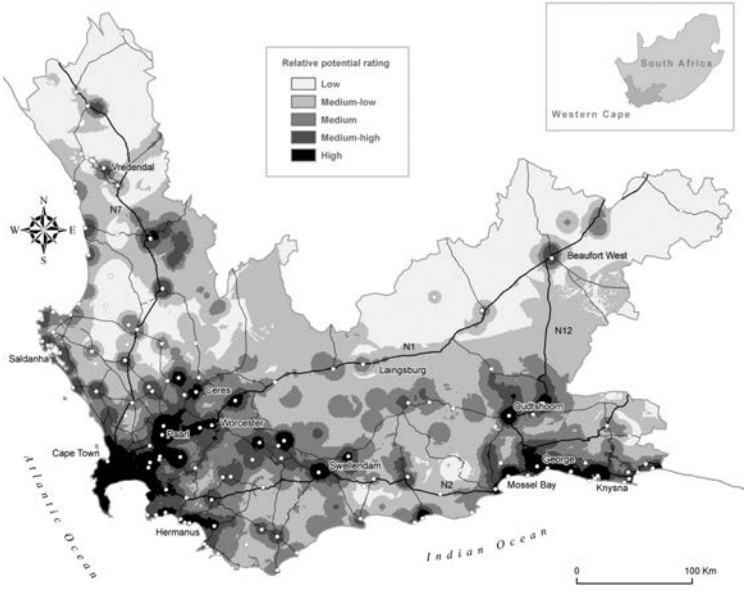

Figure 2: Potential for development of the cultural tourism product in the Western Cape

5.2 Spatial demarcation of the potential food and wine tourism product

The product potentials portrayed spatially by Figure 4 have a similar metropolitan and urban bias in their territorial manifestations. This is not surprising since the majority of food and wine attractions (eateries and wine estates) are located in these settings, and the database for such attractions had been collated at urban locations. The spatial patterns are, to a limited degree, similar to those of the culture product with its urban bias. Yet, a sufficiently distinguished and detailed impression of potential allocation as determined by the selection and weighting of variable factors (restaurants, sense of place) is evident. The prominence of the Cape Town-Winelands cluster is again eminent and aligned along linked corridors. The cluster along the Garden Route coastal belt from Mossel Bay to Plettenberg Bay is significantly less prominent in this instance and more ribbon-like. Significantly, concerning rural provincial development, the Breede River valley including Worcester, Rawsonville, Robertson and Montagu figure prominently, while cultural cores at platteland towns such as Oudtshoorn, De Rust, Clanwilliam, Tulbagh, Ceres, Riversdale and the Hex River valley feature strongly.

The Overstrand environs of Grabouw, Caledon, Hermanus and Stanford are peak performers. Again, many clustered and corridor-linked concentrations at the significant medium-high and even the medium attraction levels are evident, emphasising the excellent potential for this product throughout the province. Towns along the West Coast, in the Overberg and Little Karoo and islands of attraction such as Beaufort West and Clanwilliam earn notable mention. The regionally informed interpreter of these maps can extract superb locational insights from the detailed patterns. The major roads of the Western Cape act as opportunity attractors along corridors linking opportunity centres due to the improved market accessibility by tarred road. Again, significant smaller peaks of opportunity are evident at local platteland towns that could attract focused attention. For this product the demarcation of potential hot spots appears successful and offers a spatial indication for fruitfully selecting local areas where specific initiatives can be launched or institutionally sponsored.

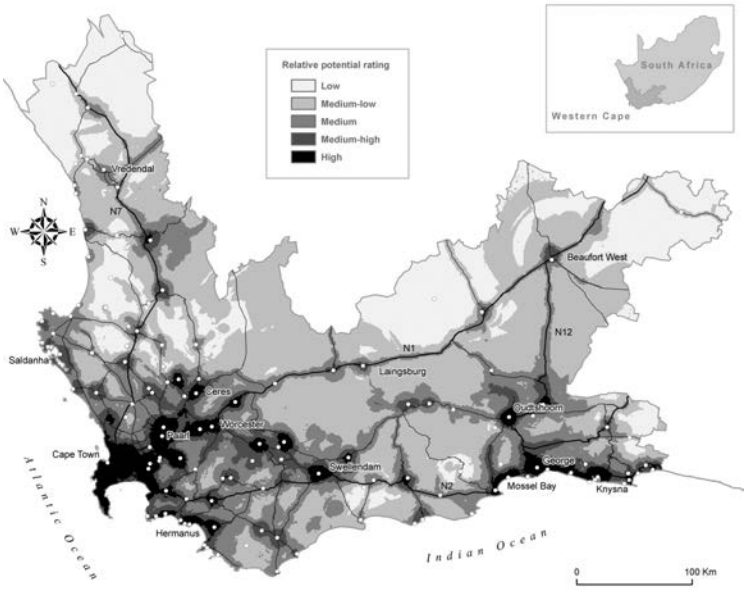

Figure 3: Potential for the development of the food and wine tourism product in the Western Cape

5.3 Comparison of the spatial analysis of the product potentials

A comparison of the patterns of high-potential allocation for the two distinct, yet conceptually related products provides insights into the powerful abilities of spatial allocation by the MCE application in GIS, and promotes assessment of the deployment of existing spatial policy. The MCE model and method are eminently able to accommodate subtle differences between related tourism products. They have done so elsewhere even more clinically between differing products. The function and role of differential weighting are clearly successful and allow decision-makers to build policy aims and outcomes into model calibration. The emergence of road corridors in the food and wine product image due to the prominence of tarred road distances in the model demonstrates the power of argued model deployment.

SAT (2007a), in its ITDF indications, listed eleven prioritised areas as tourism development zones, namely Cape Town Foreshore, Cape Flats, Stellenbosch-Paarl-Franschhoek, Langebaan-Velddrif, Overstrand, L'Agulhas, George-Mossel Bay-Oudtshoorn, Eastern gateway (Plettenberg Bay-Knysna-Wilderness), Beaufort West, Cederberg gateway, and Route 62. This rather coarse demarcation demonstrates the difference between demarcation approaches. The coarser marketing-focused approach uses evocative names (such as Route 62), known regions (Cederberg), administrative regionalisation (Overstrand) or town-specific notation (Beaufort West) to set development targets. The fine-scale spatial directive of the more objective MCE-GIS approach analyses space more surgically to isolate development potential and opportunities, and it can guide local entrepreneurial planning more accurately.

6. Conclusion and recommendations

The results of the research provide strategic direction to cultural as well as food and wine tourism developers or marketers in the Western Cape. The deliverable is a spatial tourist product opportunity indicator, spatially represented in map format at a resolution of 1 km^2 and offered as a planning and development tool and aid. It identifies, exposes and explains key elements of the cultural and policy environments in which cultural as well as food and wine tourism operate in the Western Cape. By what Olson (2010) calls statistical picturing, a resource governance model has been created that can assist the private development of tourism resources. In addition, by offering information that describes fundamental aspects of two tourism sectors and by supplying insights into and making recommendations for development, the results give stakeholders and planning proponents the ability to make informed decisions and take knowledgeable action regarding the location of targeted development in space, be it the Western Cape, or elsewhere.

Entrepreneurial recommendations call for a number of reforms and developments in product focus. Thus, a focus on quality (responsible) cultural tourism development and selective marketing to enhance experience and improve learning is advocated as prerequisite for building and maintaining sustainable cultural as well as food and

wine product destinations in the Western Cape (Tangeland 2011). These tourism products must be given distinctive, innovative and spatially focused product packaging, marketing and promotion. There is also a need to directly involve local communities (De Almeida 2010). Some dangers to be avoided in the development of cultural tourism are debasing commercial commodification of culture and the consequent loss of authenticity, meaning and function (Gnoth *et al* 2009). Regarding food tourism, Henderson (2009) warns against failure to recognise and respond to the food needs of tourists' religious observances or dietary codes (for example, those of Muslims). The dramatic increase of Chinese travellers has singular implications for hospitality businesses unfamiliar with their native cuisine, habits and culinary etiquette related to taste, presentation, variety, and quality (Karim & Chi 2010, Chang *et al* 2011). Developing institutional support for cultural as well as food and wine tourism requires sophisticated regional market research and promotion, sustainable coordination and clustering as well as networking at both regional and local scales, and training and extension opportunities to increase skills of prospective and existing entrepreneurs (Ecker *et al* 2010).

Growth in the Western Cape's tourism industry must not merely be about plant expansion, rather it must involve sustained investment based on clear choices about how to differentiate the region into important target markets for the development of destinations (SAT 2007a, Ecker *et al* 2010, Sims 2009). Among consumers globally, South Africa's label of providing a stale adventure-filled wildlife destination with striking natural beauty only must be eradicated since our cultural assets are unclear to consumers' minds and undifferentiated from the rest of the continent (SAT 2007a). The tourism industry needs to redefine, upgrade and revive products and services. This research outcome can play a significant role in tourism planning to fill some of the product and service gaps. It contributes to an understanding of our tourism resource potential and can aid tourism destination planning and review of the integrated tourism development frameworks.

Similar to the situation in the USA, the paucity of relevant data relating to local tourism development, including its locational aspects, hampers proper planning (Das & Rainey 2010). The constantly improving quality, level of detail and richness of spatial data, encouraged by the implementation of the Spatial Data Infrastructure

Act (No 54 of 2003), provide enhanced possibilities for increased accuracy in informed decision support by means of spatial modelling of economic sector development.

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